PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number:	WO 94/10855
A23G 9/14	A1	(43) International Publication Date:	26 May 1994 (26.05.94)

(21) International Application Number: PCT/DK93/00361

(22) International Filing Date: 5 November 1993 (05.11.93)

(30) Priority data:
1351/92 6 November 1992 (06.11.92) DK

(71) Applicant *(for all designated States except US)*: O.G. HØYER A/S [DK/DK]; Søren Nymarksvej 13, D-8270 Højbjerg (DK).

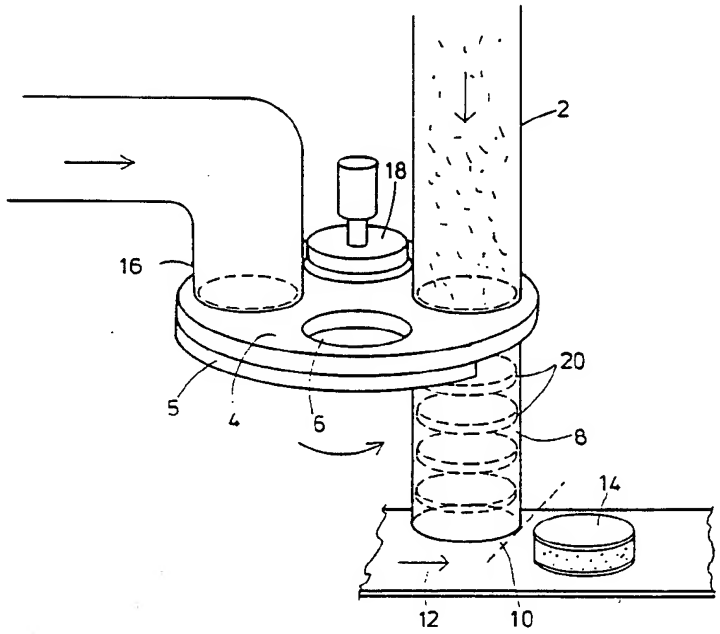
(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : KOK, Henning [DK/DK]; Stennehøj Allé 195, DK-8270 Højbjerg (DK). GONON, Peter [CH/DK]; Lauge Kochs Vej 8, DK-8200 Århus N (DK). WALDSTRØM, Ejvind [DK/DK]; Børupvej 152, D-8310 Tranbjerg J (DK). NIELSEN, Olav [DK/DK]; Sallskovvej 13, DK-8450 Hammel (DK).

(74) Agent: SKØTT-JENSEN, Knud; K. Skøtt-Jensen Patentingeniører A/S, Lemmingvej 225, DK-8361 Hasselager (DK).

(81) Designated States: AT, AU, BB, BG, BG (Utility model), BR, BR (Utility model), BY, CA, CH, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), ES, ES (Utility model), FI, FI (Utility model), GB, HU, HU (Utility model), JP, JP (Utility model), KP, KR, KR (Utility model), KZ, KZ (Utility model), LK, LU, MG, MN, MW, NL, NO, NZ, PL, PL (Utility model), PT, PT (Utility model), RO, RU, RU (Utility model), SD, SE, SK, SK (Utility model), UA, US, VN, VN (Utility model), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
In English translation (filed in Danish).

(54) Title: METHOD AND APPARATUS FOR FORMING EXTRUDED PIECES OF ICE CREAM AND CORRESPONDING SUBSTANCES



(57) Abstract

For the shaping of ice cream bodies it is a simple and inexpensive technique to produce such bodies by extrusion of the ice cream mass through an extruder pipe and successively cutting off the bodies at the outlet of this pipe. However, cutting problems occur when the mass is of the type containing macro particles. With the invention these problems are counteracted by introducing into the string of extrusion mass flat cake bodies (20) of an extrusion mass, which does not contain macro particles, whereafter the cutting is carried out through the areas, in which this easier-to-cut mass has been introduced. Different methods for the introduction or formation of these layers are disclosed, and a borderline case (Fig. 5) is described in which the cutting is effected upon the macro particles being pressed into the surface of mass block to be cut off.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgystan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

Method and apparatus for forming extruded pieces of ice cream and corresponding substances.

The present invention reltes to a method and an apparatus for producing extruded singular bodies of edible ice and other edible masses. Ice cream bodies may be formed in different manners, but most suitably by extrusion of an ice cream mass down towards a conveyor belt and cutting off from the mass the single bodies, which are then further conveyed as individual bodies along an associated belt conveyor or other receiver means.

This method is absolutely superior as long as the bodies to be produced are made of pure ice cream, but problems arise in connection with newer trends, requiring the ice cream to contain macroscopic pieces of fruit or other additives, e.g. bits of chocolate. In these cases the cutting becomes problematic, as it may be uneven due to the macro particles being present in the cut surfaces, resulting in uneven surfaces of the ice bodies. Besides, the applied cutting tools, whether made as knives or heated cutting wires, will be noticeably worn by the repeated contact with the micro particles in the mass.

It is the primary purpose of the invention to provide a method, by which the cutting can be effected without leaving any visible surface traces on the bodies and without any noticeable wear on the cutting means.

According to the invention the extrusion string of the mass concerned is arranged to be prepared in a manner such that in this string there will occur transverse layers of pure ice cream mass at the places where the string will be cut. Hereby the cuttings can be effected without the cutting means meeting the macro particles otherwise present in the ice cream mass, so the cuts may

be fully clean despite the fact that the desired macro particles occur in the major part of the cut off bodies.

According to the invention this is achievable in more different manners, primarily by arranging for narrow layers of the relevant mass without macro particles to be inserted into or formed in the extrusion string and then effecting the cutting through these added and easily cuttable layers. The layers may be established by insertion of layers cut from an extrusion string of the easy-to-cut mass or by injection of this mass after a plough body that is forced through the particle holding mass. Also, an alternating extrusion can be used, by which there is shifted between the respective masses at suitable intervals. A further possibility is to periodically introduce into the flow of particle holding mass a net plate, which will let the viscid basic mass pass through, but hold back the micro particles until the the net plate is retracted, whereby the cuttable layer will be formed just behind the net plate.

It is a still further possibility according to the invention to effect a coarse cutting off of successive discs from the extrusion string of the particle holding material and then subject these discs to such a pressing, by which the particles projecting from the surfaces are pressed inwardly, flush with the surfaces. Normally this will result in a substantial adhesion between the disc bodies and the pressing surfaces, but inasfar as the particles are now pressed into the body surface there will be provided, in the plane of separation, a thin layer without projecting particle portions, and it will thus be possible to effect an unobstructed cutting free of the bodies from the pressing surface, preferably by means of a heated wire that is caused to sweep along the pressing surface. The said coarse cutting can be made with robust tool means that may well resist the wear involved, but in return be unable to provide a fully

smooth cut.

In the following the invention is explained in more detail with reference to the drawing, in which:-

Fig. 1 is a schematic perspective view of an embodiment of an apparatus according to the invention;

Fig. 2 is a corresponding view of another embodiment;

Fig. 3 is a side view of a third embodiment; and

Figs. 4-6 are corresponding views of further embodiments.

In Fig. 1 it is shown that a downwardly conducting extruder pipe supplies an ice cream string with admixed macro particles to a mouthing area just above a transverse, rotary disc 4, which is provided with throughholes 6 of a diameter corresponding to the inner diameter of the pipe 2. The disc 4 is rotatable on an underlying, rigid bottom plate 5 having a corresponding hole just beneath the pipe 2. A pipe 8 corresponding to the pipe 2 continues downwardly from the lower side of the bottom plate 5, down to a cutting station having a cutting wire 10 that can be moved across the lower pipe mouthing in a level somewhat above an underlying conveyor belt 12. When one of the holes 6 communicates with the pipes 2 and 8 the hole and the lower pipe act as a simple extension of the extruder pipe 2, such that ice cream can be pressed down and, by means of the wire 10, be cut intermittently for forming cut-off ice cream bodies 14, which are carried away on the conveyor 12 for further working, freezing or packaging. All this may take place without troubles if or when the ice cream substance is homogenous.

When there are macro particles in the substance the disc or turntable 4 is taken in use, viz. in being turned a hole-step each time a portion corresponding to the desired thickness of the bodies 14 has been extruded. Outside the pipe 2 the holes 6 are moved through a

filling mouthing 16 for homogenous ice cream substance supplied through a pipe 17. By the turning out of a hole 6 from the pipe 2 the hole will bring along the layer of ice cream contained in that hole after the just stopped extrusion, and the disc 4 will close the mouthing of the pipe 2 until the next hole has been turned into position underneath the pipe 2. This following hole contains a homogenous ice cream layer collected from the pipe mouthing 16, whereby this layer will simply substitute the layer that has just been removed from the continuous string of ice cream in the pipes 2 and 8. When the latter layer is turned out it is brought to a rejecting station 18, in which it is pressed out from the hole 6 through an opening in the bottom plate 5 for collection and recirculation and for making the hole ready for reception of the next ice cream layer from the mouthing 16.

Thereafter the extrusion is continued until the next working cycle of the disc 4, such that the ice cream string in the pipe 8 will be provided with a series of layers 20 of a homogenous ice cream mass with a pitch corresponding to the height of the bodies 14. The cutting by means of the wire 10 is controlled in such a manner that the cutting will be effected through the layers 20 themselves, such that no cutting will take place in the ice cream mass holding macro particles. Optionally, the cutting wire can be moved through an inclined path, whereby it is possible to effect a straight cross-cutting during continuous extrusion. The method may be applied generally for the insertion of disc formations in the extrusion string, e.g. also discs of ice cream of a deviating colour or character. It will even be possible to introduce an additional disc portion midways in the bodies 14.

Fig. 2 shows another embodiment, the parts of which, however, widely correspond to the parts of Fig. 1, such that corresponding reference numerals, now with and added

" " can be used. The turndisc 4 of Fig. 1 is substituted by a reciprocal block 4 having a pair of holes 6 and 6" for cooperation with the mouthings of the respective pipes 2 , 8 and 17 , these pipes all being mounted against the underside of the bottom plate 5 . The holes 6 and 6" are both provided with pistons, 22 and 24, respectively, which are moved by suitable driving means such as cylinders 26 and 28 mounted on a rigid frame 30 on the block 4 . In one of its extreme positions, as illustrated, the block 4 will have its holes 6 and 6" corresponding with the pipes 8 and 2 , respectively, while in the opposite extreme position these holes will correspond with the pipes 17 and 8 , respectively.

With a suitable movement control of the pistons 22 and 24 it is possible to select - within the thickness dimension of the block 4 - the thickness of the discs to be collected from the respective pipes 2 and 17 , inasfar as the pistons are only moved between a bottom position flush with the lower side of the block 4 and a top position in respective, desired heights in the holes 6 and 6". An alternative possibility can be to transfer, e.g. from the pipe 2 , two or more discs to the pipe 8 for each time a single disc is transferred from the pipe 17 . It will be noted that in the embodiment according to Fig. 2 there will be no need for returning any cut-out layers.

Fig. 3 illustrates a simple embodiment comprising two extruder pipes, here designated 2" and 17" debouching into a common housing 32 having at the middle of its bottom an outlet pipe 8". Above the mouthing of the latter pipe there is provided a pivotable valve plate 34, by means of which it is possible to conduct material to the pipe 8" from either of the pipes 2" and 17". It will be readily understood that in this way it will be possible to provide for the same stratifications as in Fig. 1, while it is here possible to work with a variable

or adjustable layer thickness given by the holding times of the pivot valve plate in its respective outer positions, in combination with the flow through the pipes 2" and 17".

In Fig. 4 it is shown that right across the extruder pipe 2 there may extend a plate 36 having one hole 38 corresponding to the pipe diameter and another, corresponding hole holding a net plate 40. By means of a cylinder 42 the plate is reciprocable for switching over between the two holes. When the hole 38 is connected in the pipe 2 the particle holding mass is free to pass to the lower end of the pipe 2; but when the net 40 is introduced, the particles will be held back, such that only the pure basic mass will pass, possibly with a certain content of fine particles that will cause no troubles at the final cutting. As indicated in Fig. 4, it is possible in this manner, by repeated switching over of the plate 36, to produce particle free zones just as in Fig. 1, although with the tendency that the concentration of the coarse particles becomes higher near the underside of the discs that are finally cut off from the lower end of the pipe 2.

Fig. 5 schematically shows an embodiment, in which the extruder pipe 2 conveys the the particle holding mass to a housing 43, in which a plough wing member 44 rotates in the direction of the arrow shown, this member having openings 45 in its rear side. The wing member is rotated from a shaft 46 and receives non-particle-holding extrusion mass through a conduit 47 in which there is provided a valve 48. This valve is opened each time the wing passes the area undrneath the pipe 2, whereby the wing displaces the particular mass and fills up after itself with the particlefree mass, such that also hereby there will be extruded stratified material through the pipe 8. The stratification will not be particularly sharp, but the particlefree layers may be sufficiently

thick to ensure that there will be no macro particles in the cutting plane.

It should be mentioned as a border case that with the use of such a plough body having a cutting edge shaped front end the effect obtained will be the basically desired effect, viz. that a layer area is formed, in which the macro particles are not present, inasfar as they will here be ironed into the adjacent layer of layers of the extrusion mass. Thus, it is a possibility that the final disc bodies can be cut off by such a plough, which, with a coarse design, may well resist the cooperation with the particles. Another possibility would be to effect such a through-ploughing of the mass string and then a bringing together of the surfaces thus separated and thereafter a final cutting by moving a cutting wire exactly along the plane of the joined surfaces.

Such a technique would hardly be easy to control, but Fig. 6 shows a practical embodiment which is nevertheless based on the same considerations. The extruder pipe 2 debouches into an opening 50 in a turntable 52, which may also be a reciprocating plate block, and the extruded, particle holding mass is thereby pressed against a fixed bottom plate 54. By the associated presure the surface of the mass contacting the plate 54 will be smoothened. The part 52 is then moved so as to bring the opening 50 to a position underneath a rejector piston 56. By this movement the said mass surface will additionally be ironed along the bottom plate 54, while the associated cutting out of the block member designated 58 in the opening 50 will be effected in a coarse manner at the top side of this block member, i.e. along the lower edge 60 of the pipe 2. By the transition to the position under the piston 56 the block member 58 will be self holding in the opening 50, and it will have a smooth bottom side and a somewhat rugged top

side.

Subsequently, the piston 56 is actuated to press the block member 58 down from the opening 50. The top side of the block member will be smoothened by the very pressure of the piston, corresponding to an ironing, but normally, in return, the block member will adhere rather strongly to the surface of the piston. However, the handling has resulted in the above mentioned situation, in which there is created, adjacent to the piston surface, a - very thin - layer, in which there are no through-going macro particles, and according to the invention it is thus a realistic possibility to effect a scraping or cutting off of the pressed down block member 58 with the use of a thin knife or a sutting wire 10 that is brought to sweep along the underside of the piston 56. In just that plane the cutting tool will not have to cut through or substantially move any macro particles, so there will be no noticeable wear on the cutting tool, while the block members 58 will nevertheless be delivered with almost totally smoothened surfaces.

Should it be desirable to provide the block members 14 or 58 with projecting carrier sticks, then an insertion of such sticks can be effected unobstructed by the special arrangements according to the invention, viz. by lateral insertion either before or after the final cutting off of the block members.

C L A I M S :

1. A method of producing extruded single bodies of ice cream or similar substances, by successively cutting the substance at its outlet from an extruder pipe and delivering the cut off bodies to a take-away conveyor, the substance preferably being admixed with macro particles such as fruit pieces, characterized in that the extrusion string is prepared in such a manner that upstream of the cutting area it is made up with mutually axially spaced area, in which there is arranged or inserted a layer of a substance of another character, preferably a more easily cuttable mass such as a corresponding substance without the said macro particles, or, alternatively, in which there is arranged a pressing-in of the macro particles in the respective surfaces at a separation area, the final cutting off of the single bodies being effected through the said inserted layers or the said separation areas.

2. A method according to claim 1, characterized in that the insertion layers are formed by moving across the extrusion string a rejector or displacement body, behind which the cuttable substance is introduced, either as a preshaped cake or by injection, preferably through the rear edge area of the rejector or displacement body.

3. A method according to claim 1, characterized in the easier cuttable intermediate layers are provided by insertion of a net plate in and across the extruder pipe for temporary retention of the macro particles during continued extrusion.

4. A method according to claim 1, characterized in that precut discs from supply pipes for particular substance and non-particular substance, respectively, are brought successively together in an outlet pipe, at the outlet of which cutting means are actuated for cutting

the outlet product through the non-particular layers thereof.

5. A method according to claim 1, characterized in that the particle holding substance is forced against a smooth bottom surface in a receiver opening, which is then laterally moved to a position beneath a rejector piston that pushes out the block member thus formed, into a position in which it is accessible for smooth scraping off from the piston surface.

6. An apparatus for carrying out the method according to claim 1, comprising a supply pipe for an extrusion material and means for successive cutting off of block members from an outlet pipe, characterized by means for successive establishing of easily cuttable cutting zones between adjacent layers of the extrusion material, viz. either for introducing an easily cuttable mass in mutually spaced layers of substantial thickness in the flow of the extrusion material or for producing a local displacement of macro particles in the extrusion material in such a manner that the latter is rendered easily cuttable or, respectively, easy to cut free from a forming surface.

7. An apparatus according to claim 6, characterized in that the means for introducing the easily cuttable substance layers comprise a rotatable or displaceable plate member which crosses the supply and outlet pipes for the primary extrusion material and has one or more throughlet openings, which, when displaced laterally from the aligned pipes, can bring along a disc of the extrusion material and be moved to a rejector station in which this disc is rejected from the opening and then to a filling station for filling the opening with a secondary, easily cuttable substance, such that the opening, when returning to the pipe crossing position, will bring along and introduce an easily cuttable disc of the secondary substance into the flow or string of the

primary extrusion material.

8. An apparatus according to claim 6, characterized in that the means for introducing the easily cuttable substance layers comprise a rotary or displaceable plate member having receiver openings which, by rotation or displacement of said plate member, can be brought to correspond with the delivery ends of supply pipes for primary and secondary extrusion material, and, respectively, with the inlet end of a product receiver pipe, piston means being provided at least at said inlet end for successively pressing into the product pipe the thus alternatingly supplied disc bodies of the primary and secondary extrusion material.

9. An apparatus according to claim 6, characetrized in that the means for introducing the easily cuttable substance layers comprise a switch over valve plate, which in one position connects the supply pipe for primary substance to the inlet mouthing of the outlet pipe, while in an opposite position it connects an additional supply pipe for easily cuttable substance to the same inlet mouthing.

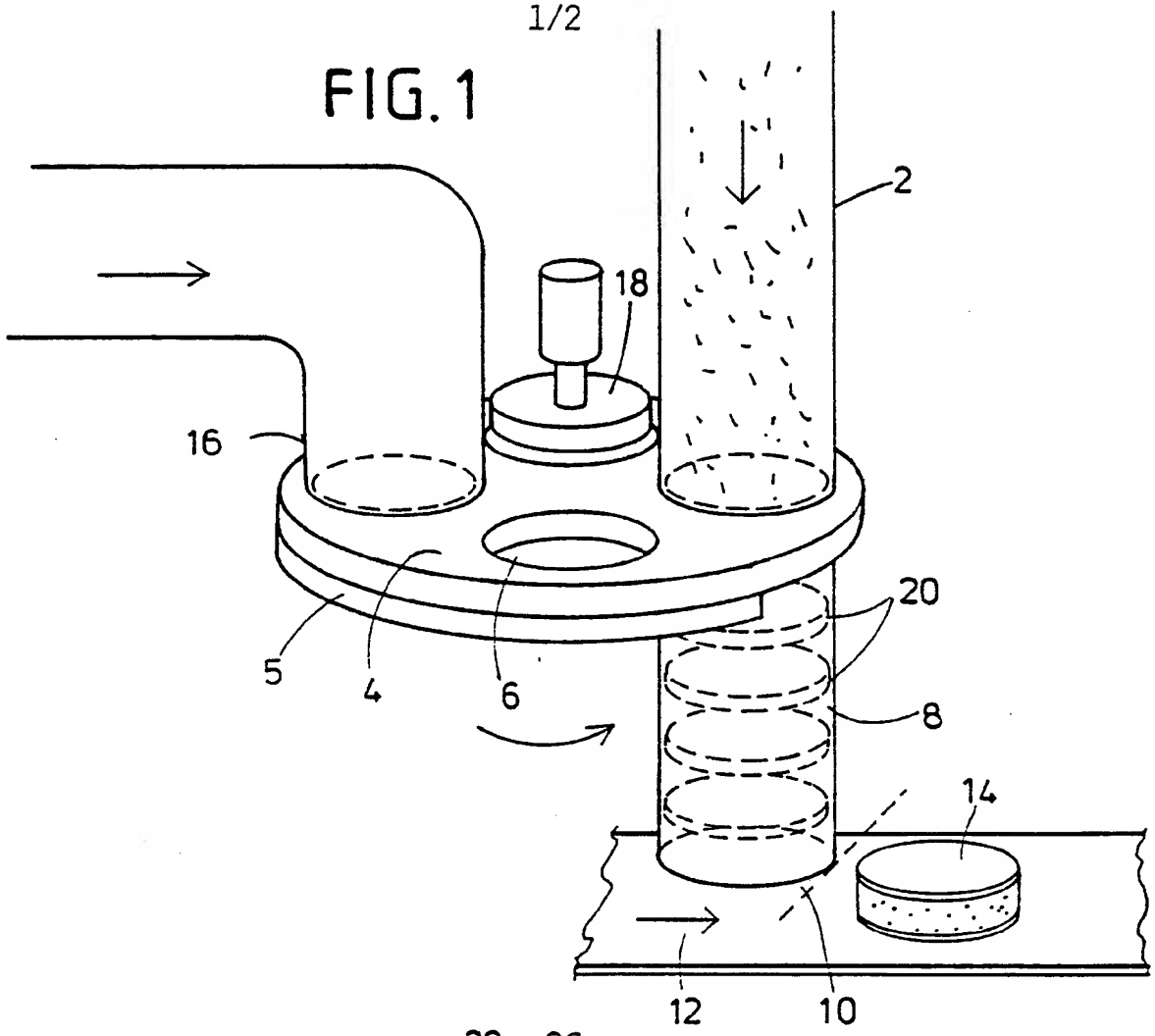
10. An apparatus according to claim 6, characterized in that the means for introducing the easily cuttable substance layers comprise a plough body, which is cross movable through the extrusion flow and has at its rear side one or more openings, through which a secondary extrusion substance can be delivered from a supply pipe in order to build up a fill in layer behind the plough body.

11. An apparatus according to claim 6, characterized in that the means for forming the easily cuttable substance layers comprise a rotatable or displaceable plate member, which crosses between the supply pipe and the outlet pipe for the extrusion material and is provided with a free flow-through opening and with a similar opening in which a plate net is arranged,

dimensioned for retention of macro particles occurring in the substance.

12. An apparatus according to claim 6, characterized in that the means for forming the easily cuttable material layers comprise crosswise displaceable receiver opening means for the particle holding extrusion substance, these opening means being displaceable to a position, in which a corresponding piston is operable to press out from the opening means the material discs thus formed, the apparatus being controlled such that the final cutting free of the extruded block members is effected as a cutting closely along the pressure applying piston surface.

FIG. 1



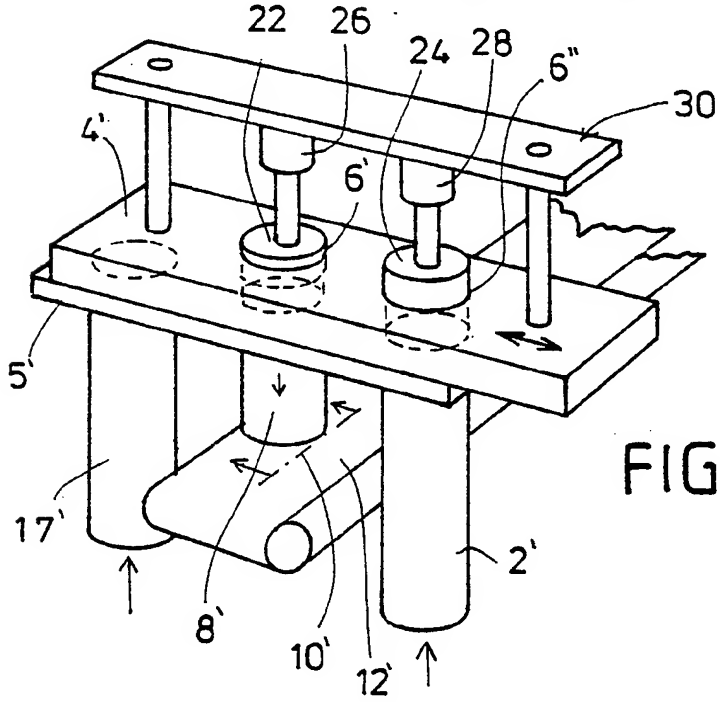


FIG. 2

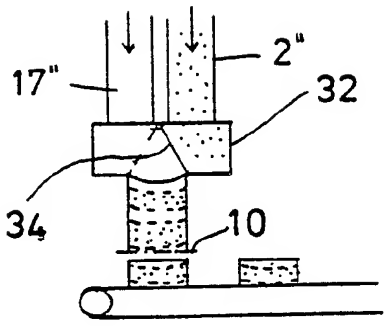


FIG.3

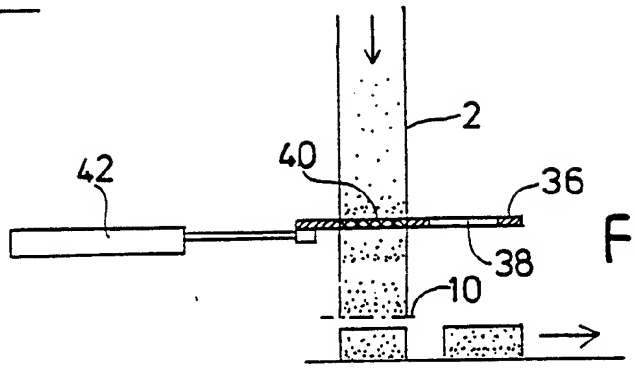


FIG.4

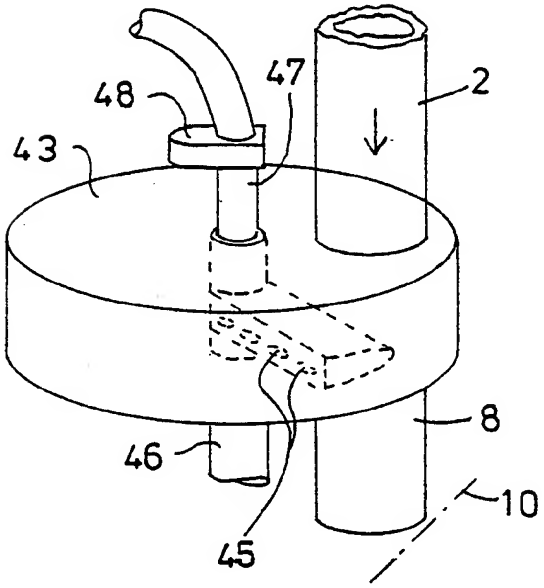


FIG.5

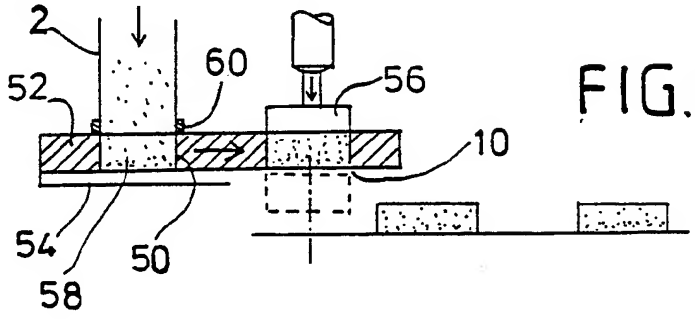


FIG.6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 93/00361

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: A23G 9/14
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A1, 0373246 (FRISCO-FINDUS AG), 20 June 1990 (20.06.90), figures 1-7, claims 1-14	1-12

--

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 January 1994	04 -02- 1994
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Agneta Änggård Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/12/93

International application No.
PCT/DK 93/00361

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0373246	20/06/90	SE-T3- 0373246	
		AU-B- 622074	26/03/92
		AU-A- 4554889	21/06/90
		CA-A- 2004058	15/06/90
		JP-A- 2215350	28/08/90
		US-A- 5031567	16/07/91